Space Weather Forecast

Issued on Saturday 5 October 2024 at 01:10 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate radio blackouts (R1/R2) expected throughout, chance of further Strong radio blackouts (R3). Minor/Moderate geomagnetic storms (G1/G2) expected, chance Strong (G3) over UTC weekend.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Moderate in the period, with the peak flare a Moderate-class X-ray flare at 04/0455UTC from the large, central complex sunspot region (responsible for the largest flare of the cycle in the previous 24-hour period). Background X-ray flux has been notably high, but decreased slightly over the 24 hours.

There are seven sunspot regions on the facing side of the Sun at present, with a small magnetically unipolar spot fading from view in the eastern hemisphere as two further regions in the west neared the horizon. The southwestern quadrant is particularly congested, with several large and complex regions occupying this part of the Sun at present, including those responsible for recent Strong-class flares (prior to the current reporting period).

The two most complex sunspot regions have several small 'filaments' strung through their constituent sunspots at present - something to monitor given their tendencies towards occasional large flares (these filaments could be destabilised by any flares from the sunspots to become Coronal Mass Ejections (CMEs)). Some instability was observed in filaments in the south-central and far southwest quadrant into the UTC evening of 04 October, although no CMEs have been associated with these at the time of writing. Instead, the up to three CMEs seen heading southeast through the UTC day are thought to be associated with a narrowly far-sided southwestern activity to no effect at Earth. A northeast-heading event in the UTC evening was also thought far-sided.

No new Earth-directed CMEs were therefore in evidence.

Solar Wind / Geomagnetic Activity: The solar wind was indicative of a slow regime. The solar wind speed showed a very slight rising trend within normal background levels. Both the number of particles comprising the solar wind and their associated magnetic fields were unremarkable in the period, with the north-south component of the field erratic and not spending protracted periods anti-aligned with Earth's field (helping to limit geomagnetic activity).

The net effect of the above solar wind measures was for provisionally mostly quiet geomagnetic indices.

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Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Moderate, with a chance of returning to High should another isolated Strong-class X-ray flare occur, these most likely originating from either of the two large southwestern sunspot regions. Recurrence does not suggest any returning large sunspot regions in the forecast period, and both the major active regions on the facing side are present throughout - the significant flare risk is therefore largely constant.

Solar Wind / Geomagnetic Activity: There are two main CMEs due in the period: firstly a glancing blow from the Strong-class flare CME from 01 October into day one, Saturday 05 October. Secondly and more assuredly, the arrival of a CME from the 03 Oct Strong-class flare CME should arrive late on day one, or else early on (day two) Sunday 06 October.

Confidence is low into the new UTC working week, however any further CME glances are expected to be slight. G1-G2/Minor-Moderate Geomagnetic Storm periods are expected over the current UTC weekend. Depending on how distinct the inbound CMEs are, and how much the first (lower confidence event) primes the Earth's magnetosphere, there may be a chance of G3/Strong geomagnetic storm conditions and even a slight chance of isolated G4/Severe intervals.

A fast wind from a coronal hole is perhaps then due later on day four, Tuesday 08 October, potentially bringing elevated solar winds and a late further slight chance of G1.

Energetic Particles / Solar Radiation: There is a daily chance of solar radiation storms despite the lack of any recent enhancements, as the two largest and most complex groups move through the most prone part of the solar disc in the period.

Geomagnetic Storms

Geomagnetic Storm	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Minor or Moderate	G1 to G2	No	80	80	60	10
Strong	G3	No	50	50	5	1
Severe	G4	No	20	20	1	1
Extreme	G5	No	5	5	1	1

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Radio Blackouts - X-Ray Flares

X-Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 (M Class)	Yes	85	85	85	80
Very Active	R3-R5 (X Class)	No	30	30	30	25

Solar Radiation Storms (High Energy Protons)

Radiation Storms	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	25	25	25	25
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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